Four new species of *Cyperus* L. (Cyperaceae) from northern Queensland

R.Booth, D.J.Moore & J.Hodgon

Summary

Booth, R., Moore, D.J. & Hodgon, J. (2009). Four new species of *Cyperus* L. (Cyperaceae) from northern Queensland. ***Austrobaileya* 8(1): 35–46**. Four new species allied to *Cyperus pedunculosus* F.Muell., viz. *Cyperus alaticaulis* R.Booth, D.J.Moore & Hodgon, *C. eboracensis* R.Booth, D.J.Moore & Hodgon, *C. multispiceus* R.Booth, D.J.Moore & Hodgon and *C. sharpei* R.Booth, D.J.Moore & Hodgon are described and notes provided on their distribution and habitat. *Cyperus pedunculosus* is circumscribed and described. A key to this group of species is provided.

Key Words: Cyperaceae, *Cyperus*, *Cyperus alaticaulis*, *Cyperus eboracensis*, *Cyperus multispiceus*, *Cyperus pedunculosus*, *Cyperus sharpei*, Australian flora, Queensland flora, species limits, ordination, cluster analysis, identification key

R.Booth, D.J.Moore & J.Hodgon, Queensland Herbarium, Department of Environment & Resource Management, Brisbane Botanic Gardens, Mt Coot-tha Road, Toowong, Queensland 4066, Australia. Email: ron.booth@derm.qld.gov.au

Introduction

Cyperus L. *sens. lat.* includes about 700 species, the vast majority of which occur in the tropics and subtropics. There is much variation within the genus and many attempts have been made to subdivide it. These include recognizing the subdivisions at subgeneric level, or as distinct genera (Raynal 1973). Recent treatments have also taken into account the presence of C_3 and C_4 photosynthetic pathways (Bruhl 1995).

Correlating photosynthetic pathway with inflorescence structure has proven to be problematic in the delimitation of genera related to *Cyperus* and sections within *Cyperus*, at least in relation to the Australian taxa. A rigorous infrageneric classification for *Cyperus* can probably only be arrived at following extensive molecular investigation throughout the range of the genus.

Despite these classification shortcomings, some obvious groupings of taxa can be arrived at based upon similarities in both vegetative and floral morphology. In Australia, one such grouping can be based around the taxon known as *Cyperus pedunculosus* F.Muell. which has been classified in *Cyperus* section *Diffusae* C.B.Clarke (Clarke 1884, as 'Diffusi'). Extensive field work undertaken in recent years, throughout Queensland and particularly in the monsoonal tropics of Cape York, has resulted in the accumulation of much more material of *Cyperus* that can be allocated to this taxonomic section. Past applications of the name *Cyperus pedunculosus* are now considered to apply to several taxa, some of which are unnamed. Critical examination of this material now enables four new species to be named.

These new species show similarities in their glumes, nuts and overall spikelet characteristics to *Cyperus pedunculosus*, but differ notably in their preference for drier, fire prone habitats than those where that species occurs. Consequently their morphology may be a direct adaptation to these environmental conditions. They possess stout rhizomes or swollen, bulbous or fibrous bases. *Cyperus pedunculosus* occurs within closed forests that are not affected by fire and does not have any of these morphological features.

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Materials and methods

The 33 specimens used in the phenetic analyses as Operational Taxonomic Units (OTUs) were drawn from field-collected specimens from northern Queensland and herbarium specimens at BRI. All taxa included were represented by between four to nine OTUs (data available from the authors).

Characters (**Table 1**) were selected on the basis of an examination of the variation observed among taxa and the critical assessment of past studies. The character-state data for all OTUs were entered into a data matrix originally prepared as a spreadsheet in Microsoft Excel 7.0. Original data collection-sheets were cross-checked with data in the spreadsheet to guard against errors.

Table 1. List of characters used in phenetic analyses.

Numbers refer to those in Appendix 1.

1	Culm length (mm) (measured to the base of the primary inflorescence bract)
2	Culm width (mm) (measured at the mid-length of culm)
3	Culm cross section: (1) trigonous, (2) triquetrous
4	Involucral bracts - septate nodules presence: (1) absent, (2) present
5	Primary inflorescence bract length (mm)
6	Primary inflorescence bract width (mm) (at the widest part of the bract)
7	Base of primary inflorescence bract – teeth: (1) absent, (2) present
8	Inflorescence structure: (1) simple, (2) compound, (3) decompound
9	Spikelet width (mm) (measured at the mid-length of the spikelet)
10	Rachilla wing: (1) absent, (2) present
11	Glume length (mm)
12	Glume mucro length (mm): (1) <0.3, (2) 0.3–0.7
13	Style length (mm)
14	Nut length (mm)
15	Nut width (mm) (measured at the widest part of the nut)

Data was analysed using a number of numerical methods. For the phenetic analysis, the Gower distance coefficient (which includes range standardization of data) was applied to all data matrices as it handles mixed data (Crisp & Weston 1993). The unweighted pair-group method with arithmetic mean (UPGMA, with β = -0.25; Belbin 1993) was used.

Ordination was performed using semi-strong-hybrid multidimensional scaling (SSH) in 2-dimensions with 200 random starts on non weighted character states to minimise stress values. Ordinations were assessed by examining stress values and correlations of character states with ordination vectors (Belbin 1993).

Correlations between character states and ordination vectors were performed to assess which character states were contributing to the pattern of ordination. Although all character states contribute to the overall ordination pattern, correlations above 0.7 are considered diagnostic of the taxa involved (Crisp 1991).

Results and discussion

The ordination plot of the data matrix resulted in discrete groupings of OTUs representing all of the taxa included (**Fig. 1**). Eleven of the 22 character states correlated with ordination vectors >0.7 (**Table 2**) indicating that half of the characters included contributed strongly to the ordination pattern. All the groups recognised in the ordination were discrete, but two groups of OTUs were relatively loosely clustered (e.g. *Cyperus alaticaulis* and *C. multispiceus*) as a result of missing values.

Cluster analysis of the data matrix (**Fig. 2**) mirrors and confirms the results of the ordination (**Fig. 1**).

These five groups are recognised as five discrete species in the following taxonomic account.

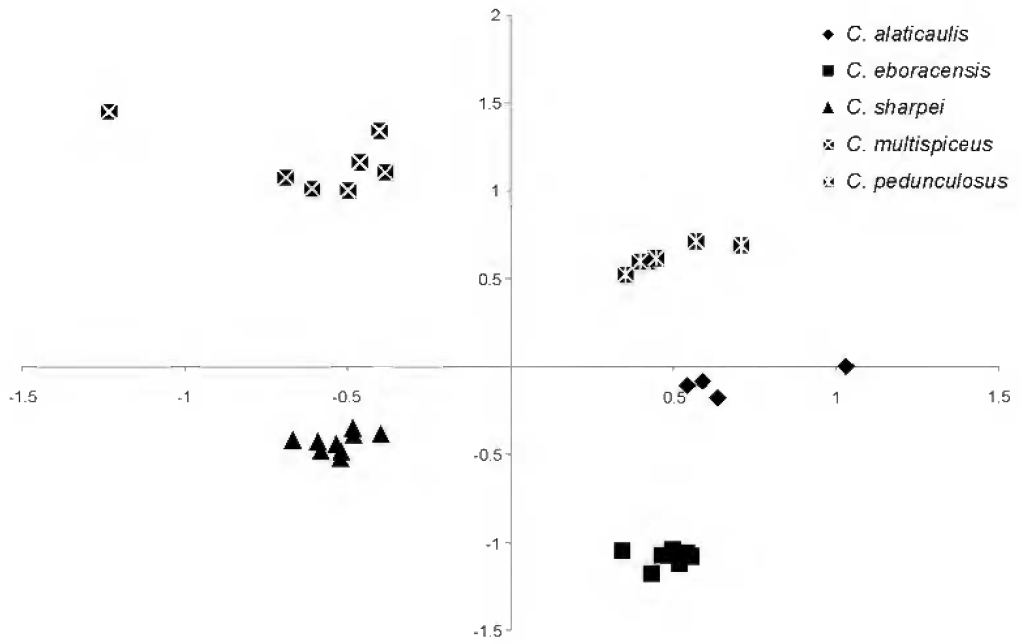

Fig. 1. Ordination plot of the data matrix
Character states unweighted; Gower association measure; semi-strong-hybrid multidimensional scaling in 2-dimensions with 200 random starts. Stress value = 0.0837.

Taxonomy

Key to the *Cyperus pedunculosus* species group

1 Inflorescence simple. 2
1. Inflorescence compound 3

2 Culms winged; proximal involucral bract 3–4.3 mm wide. . . . . **2. C. alaticaulis**
2. Culms not winged; proximal involucral bract 1.5–2.8 mm wide. . . . . **3. C. eboracensis**

3 Culms mostly trigonous; closely arranged on a stout rhizome, occurs in skeletal soils in eucalypt woodland. . . . . **5. C. sharpei**
3. Culms mostly triquetrous; tufted, occurs in and adjacent to closed and riparian forests 4

4 Inflorescence of 4–12 spikes . . . . . **1. C. pedunculosus**
4. Inflorescence of 20–80 spikes . . . . . **4. C. multispiceus**

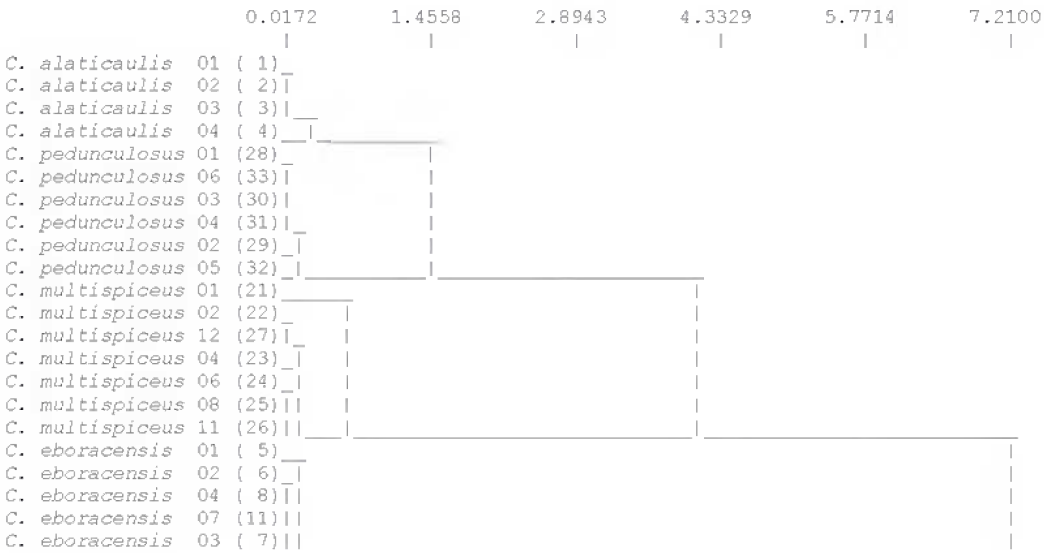

Fig. 2. Phenogram of the data matrix
Character states unweighted; Gower association measure; and UPGMA (β = -0.25) fusion strategy (data matrix 1).

1. *Cyperus pedunculosus* F.Muell., *Fragm.* 8: 266 (1874); *C. pedunculosus* var. *pedunculosus* Domin, *Biblioth. Bot.* 85: 425 (1915). **Type citation:** "Ad oram Rockingham's Bay in altis montibus rupestribus, atque secus fluvios silvarum; Dallachy". **Type:** Queensland. Rockingham's Bay, *s.dat., J.Dallachy s.n.* (holo: MEL *n.v.*; iso: BRI [AQ308150]).

Cyperus montis-sellae K.Schum., *Bot. Jahrb. Syst.* 18: 186 (1894). **Type:** Papua New Guinea. "Auf dem Gipfel des Sattelberges", 14 January 1889, *D.Hellwig 249* (*n.v.*).

Cyperus pedunculosus var. *floribundus* Kük., *Bot. Jahrb.Syst.* 59: 44 (1924). **Type:** Papua New Guinea. Sattelberg, *C.Nyman 491* (*n.v.*).

Cyperus pedunculosus var. *atrocastaneus* Kük., *Bot. Jahrb. Syst.* 69: 256 (1938). **Type:** Papua New Guinea. Central Province: Isuarava, *C.E.Carr 15451* (syn: *n.v.*); Papua New Guinea. Morobe Province: Ogeramnang, *M.S.Clemens 4978* (syn: *n.v.*); Papua New Guinea. Morobe Province: Mt Sarawaket, *M.S.Clemens 6071* (syn: *n.v.*).

Cyperus pedunculosus var. *alatus* Kük., *Mitt. Thür. Bot. Ver. N.F.* 50: 3 (1943). **Type:** Papua New Guinea. Morobe Province: Boana, 3 November 1938, *M.S.Clemens 8772b* (*n.v.*).

Cyperus pedunculosus var. *longebracteatus* Domin, *Biblioth. Bot.* 85: 425 (1915). **Type citation:** "Nordost-Queensland: Bellenden-Ker, in der Nähe eines Baches in einer Höhe von ungefähr 200 m, selten (DOMIN, XII. 1909)." **Type:** (holo: PR, *n.v.*).

Plants robust, perennial with a short rhizome. *Culms* tufted, erect, triquetrous to distinctly 3-winged, striate, 25–45 cm long, 2–5 mm wide, thickened by inflated, scarious, purplish sheaths. *Leaves* longer than inflorescence culm, canaliculate at the base, otherwise flat, 6–20 mm wide. *Involucral bracts* 5–6, 30–45 cm long, 6–15 mm wide, unequal in length, longer than inflorescence, scabrous. *Inflorescence* once compound, or decompound, 10–20 cm long, 7–12 cm wide, diffuse. Rays unequal, (3–)6–11(–15). *Spikes* 6–12; sessile or pedunculate, ovoid, spreading, dense, 5–25 mm long, 8–40 mm

Table 2. Correlations of character states and ordination vectors.

Character state	Correlation
Culm cross section trigonous	0.9668
Culm cross section triquetrous	0.9668
Base of primary inflorescence bract teeth absent	0.9528
Base of primary inflorescence bract teeth present	0.9528
Involucral bracts septate nodules absent	0.9151
Involucral bracts septate nodules present	0.9151
Style length (mm)	0.8489
Glume mucro length <0.3 mm	0.8084
Glume mucro length 0.3–0.7 mm	0.8084
Rachilla wing absent	0.7224
Rachilla wing present	0.7224

wide, with 1–7 spikelets. *Spikelets* 5–25 mm long, 2.5–3.2 mm wide, 10–40(–50)-flowered, digitate, spreading, linear, reddish brown to dark brown to dark grey to black. *Glumes* distichous, 2.5–3.5 mm long, dark reddish or red-brown or blackish-red or ferrugineous or streaked red-brown, apex mucronulate or mucronate or acuminate, mucro excurved or straight, one third to two thirds imbricate, keeled, 1.1–1.3 mm apart, 4–10 nerved, with arcuate keel. Rachilla straight, persistent, winged. *Stamens* 3; anthers linear; connective setulose; 0.5–0.9 mm long. *Style* shorter than stigmas, 3-fid, 1.2–1.5 mm long. *Nut* obovoid to ellipsoid; trigonous to triquetrous, or dorsiventrally compressed or flattened with a flat or concave face against the rachilla, half as long as the glume, 1.5–2 mm long, 1–1.25 mm wide, smooth or densely granulose or granulate, with sides exposed, apex apiculate or rounded, brown to golden brown.

***Additional selected specimens examined*: Papua New Guinea.** Eastern Highlands Province: Kini Creek, NE slopes of Mt Michael, Sep 1959, *Womersley NGF11715* (BRI). Morobe Province: 5 km from Markham River Bridge along road to Labu, Jul 1992, *Forster PIF11067 & Liddle* (BRI, LAE). Northern Province: N slope of Mt Lamington, Jul 1953, *Hoogland 3320* (BRI). Central Province: E slope of Lake Myola No. 2, Sep 1973, *Croft NGF34536* (BRI). **Queensland.** Cook District: Davies Creek, S.F.607, 9 km past N.P. carpark, Jun 1991, *Forster PIF8536* (BRI); Bellenden Ker, 40 m below tower 3, May 2001, *Booth et al. 2614* (BRI, K, NSW); Foothills of Mt Bellenden Ker, May 2001, *Cooper 1529* (BRI); Bellenden Ker Cable Car Station, Jan 2002, *Booth et al. 2834* (BRI); Junction Creek, Russell River, Apr 1948, *Brass 18262* (BRI); Wooroonooran N.P., CSIRO EP/34, off Russell River track, Jan 2007, *Ford AF4910 & Metcalfe* (BRI, NSW); Bartle Frere, Oct 1935, *Blake 9758* (BRI); East Bartle Frere, Nov 1994, *Hunter JH1837* (BRI). Wide Bay District: Fraser Island, Oct 1930, *Hubbard 4396* (BRI); Fraser Island, May 1964, *Webb 6328* (BRI, CANB); track up to Mt Bowarrady tower, Fraser Island, Sep 1986, *Russell-Smith 1809 & Lucas* (BRI). Moreton District: McDonald Road, 3 km N of Peachester, Jul 1993, *Bean 6256* (BRI); Mooloolah Scrubs, Dec 1890, *Field Naturalists s.n.* (BRI [AQ 647235]); Base of Buderim Mt., Mar 1934, *Blake 5251* (BRI).

***Distribution and habitat*:** *Cyperus pedunculosus* is found throughout coastal Queensland from Buderim north to Davies Creek near Cairns. It is also widely distributed in New Guinea. Plants occur in wet forests often along shady creek banks.

***Notes*:** A number of varieties have been named under *Cyperus pedunculosus*, three from Papua New Guinea (Kükenthal 1924, 1939, 1943) and one from north Queensland (Domin 1928). Blake (1947) and Kern (1974) were of the opinion that these varieties and also *Cyperus montis-sellae* K.Schum. were merely minor variations of *C. pedunculosus* and this is also our conclusion based upon the protologue descriptions by Schumann

(1894) and Kükenthal (1924, 1938, 1943). Although we have not seen the type of Domin's variety, it is clearly illustrated in his account and from the brief description of the specimen in the protologue, it differs only in the longer involucral bracts from typical *C. pedunculosus*. Hence, neither the name *Cyperus montis-sellae* or any of the previously published varieties of *C. pedunculosus* are applicable to the species being described as new in this paper.

2. *Cyperus alaticaulis* R.Booth, D.J.Moore & Hodgon, **species nova** a *Cypero pedunculoso* inflorescentia simplici (in illo complexo), spiculis pluribus in quaque spica (10–25 non 1–7) et stamine solitario (in illo 3) differens. **Typus:** Queensland. Cook District: 26 km WSW of Lockhart River township, 7 km SSE of Mount Bowden, Cape York mapping site 679 (HEL 41), 20 April 1993, *J.R.Clarkson 9933 & V.J.Neldner* (holo: BRI; iso: CNS, K, NSW).

Cyperus sp. (Chester River J.R.Clarkson 2392); Booth (2007: 58).

Plants slender, perennial, glabrous. *Culms* tufted, erect, triquetrous, increasingly winged towards the distal end, 19–36 cm long, 1–3.8 mm wide; base swollen and bulbous. *Leaves* basal, 8–20 cm long, 2.5–4 mm wide, septate-nodulose. *Involucral bracts* 2–5, unequal in length, longer than inflorescence. Proximal bract 4–12 cm long, 3–4.3 mm wide. *Inflorescence* simple, 1–2 cm long, 1–2.5 cm wide. *Spike* globose or ovoid, dense, 10–20 mm long 10–25 mm wide, with 5–30 spikelets. Rachis angular. winged. *Spikelets* 10–20 mm long, 2.5–3.5 mm wide, 10–35-flowered, straight, digitate, spreading or reflexed, linear to linear–lanceolate. *Glumes* distichous, 2.2–2.8 mm long, apex mucronate, one half to two thirds imbricate, keeled, 1–1.2 mm apart, 1 or 2 nerved, with arcuate keel. Rachilla straight. *Stamens* 1. Anthers 0.5–0.8 mm long. *Style* 0.7–1.1 mm long, 3-fid, longer than or as long as stigmas, shorter than nut, flat. *Nut* ellipsoid, trigonous, one third to half as long as glume, 1.2–1.8 mm long, 0.7–1 mm wide, granulose, apex rounded, dark brown to brown. **Fig. 3 A–E.**

***Additional selected specimens examined*: Queensland.** Cook District: 1 km SE of Heathlands, near the pump site, Mar 1992, *Clarkson 9309 & Neldner* (BRI, DNA, K, MBA, NSW, P); Chester River, on Eastern fall of McIlwraith Range, Jul 1978, *Clarkson 2392* (BRI); 9 km N of Batavia Downs on the Peninsula Development Road, Apr 1990, *Clarkson 8531 & Neldner* (BRI, K, NSW).

***Distribution and habitat*:** *Cyperus alaticaulis* is endemic to Queensland on northern Cape York Peninsula where it has been recorded from the Chester River northwards (**Map 1**). Plants grow in dry sandy loams in eucalypt woodland.

***Notes*:** *Cyperus alaticaulis* is distinguished within this group by the simple inflorescence, winged culms and broad, proximal involucral bracts (3–4.3 mm wide).

It is not a common species and has only been collected at four localities. Although it is found in a similar habitat to *Cyperus eboracensis* it can be easily distinguished from that species by the winged culms and broader involucral bracts.

***Etymology*:** From the Latin *alatus* (winged) and *caulis* (stemmed), so named because the culm becomes increasingly triquetrous towards the distal end.

3. Cyperus eboracensis R.Booth, D.J.Moore & Hodgon, **species nova** a *Cypero pedunculoso* inflorescentia simplici (in illo complexo) et cauli basi tumido bulbosoque differens. **Typus:** Queensland. Cook District: 3.7 km E of the Peninsula Development Road on an IWS track leaving the main road 0.5 km N of the Laura River, 26 April 1983, *J.R.Clarkson 4721* (holo: BRI; iso: NSW).

Cyperus sp. (Cape York J.R.Clarkson +8126); Booth (2007: 58).

Plants slender, perennial, glabrous. *Culms* tufted, erect, triquetrous, striate, glabrous, 30–60 cm long, 0.6–1 mm wide, base swollen and bulbous. *Leaves* basal, 12–30 cm long, 1–3.5 mm wide. *Involucral bracts* 4–6, unequal in length, longer than inflorescence, scabrous. Proximal bract 5–30 cm long, 1.5–2.8 mm wide. *Inflorescence* simple, 10–25 mm long, 10–30 mm wide. *Spike* sessile, globose, ovoid or hemispherical, dense, 10–25 mm

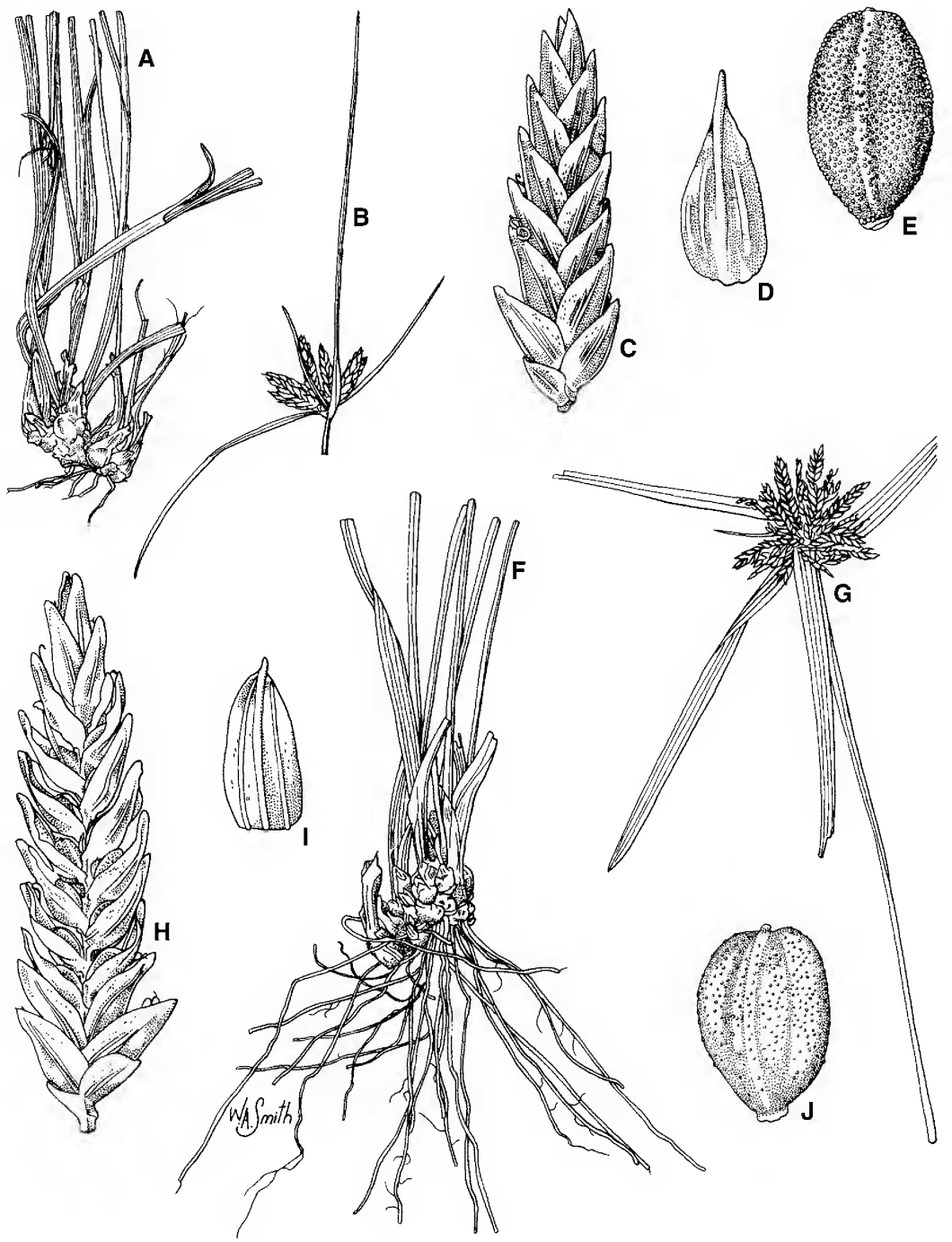

Fig. 3. ***Cyperus alaticaulis***, A. base of plant showing bulbous base of culms × 1. B. inflorescence × 1. C. spikelet × 6. D. glume × 12. E. nut × 24. ***C. eboracensis***, F. base of plant showing bulbous bases × 1. G. inflorescence × 1. H. spikelet × 6. I. glume × 12. J. nut × 24. A–E *Clarkson 2392* (BRI); F–J *Wannan 4515* (BRI).

long, 10–30 mm wide, with 10–30 spikelets. *Spikelets* 10–25 mm long, 1.8–2.5 mm wide, 10–40 flowered, sessile, straight, digitate, erect, linear or linear lanceolate. *Glumes* 2.4–3 mm long, apex mucronulate or acute, one half to two-thirds imbricate, keeled, 1.2–1.4 mm apart, 1–3-nerved (one prominent), with an arcuate keel. Rachilla straight, persistent, winged. *Stamens* 2 or 3; anthers linear, connective smooth, 0.5–1 mm long. *Style* longer than stigmas, 3-fid, shorter than nut, flat, 0.7–1 mm long. *Nut* obloid to obovoid to ellipsoid, trigonous, faces convex, one-third to half as long as the glume, 1.2–1.5 mm long, 0.7–0.9 mm wide, granulose, falling with glume, apex apiculate, dark brown to brown. **Fig. 3 F–J.**

***Additional specimens examined*: Queensland.** Cook District: St. Paul's Village, Moa Island, Torres Strait, May 1999, *Waterhouse BMW5324* (BRI, CANB); 36.2 km from Peninsula Development Road along road to Portland Roads, site CY254, Jul 1991, *Neldner 3517 & Clarkson* (BRI, MBA); 11.5 km W of the Laura to Musgrave road on the track to Dixie, Cape York mapping site 21 (DIX 20), Jun 1989, *Clarkson 8126 & Neldner* (BRI, DNA, K, NSW); 1.5 km NW of Marina Plains homestead, site CY415 (MP17), Apr 1992, *Neldner 3758 & Clarkson* (BRI, DNA, NSW, PERTH, QRS); S of Five Mile Creek, May 2004, *Wannan 3550 & Verdec* (BRI); 20.4 km from the McIvor River crossing on the Hopevale to Starcke road towards Battlecamp, May 1993, *Clarkson 10071B & Neldner* (BRI, K, NSW).

***Distribution and habitat*:** *Cyperus eboracensis* is endemic to Queensland where it has been recorded from the Daintree River north to Moa Island (**Map 2**). Plants grow in dry sandy loams in eucalypt woodland.

***Notes*:** *Cyperus eboracensis* is distinguished within this group of species by the simple inflorescence, the unwinged culms and relatively narrow, proximal involucral bracts (1.5–2.8 mm wide).

***Etymology*:** From the Latin *eboracum*, the Romano-British name for York, England and *–ensis*, suffix indicating origin or place; the species is restricted to Cape York.

4. Cyperus multispiceus R.Booth, D.J.Moore & Hodgon, **species nova** a *Cypero pedunculoso* spicis pluribus in quaque inflorescentia (20–80 non 4–12) et antheris longioribus (1.2–1.7 non 0.5–0.9 mm) differens. **Typus:** Queensland. Cook District: Cotterell River, 13 km S of Vrilya Point. Cape York mapping site 673 (HEL 35), *J.R.Clarkson 9882 & V.J.Neldner* (holo: BRI; iso: K, NSW).

Cyperus sp. (The Boulders J.A.Elsol 818); Booth (2007: 58).

Plants robust, perennial, glabrous. *Culms* tufted, erect, triquetrous, striate, 39–76 cm long, 1.4–3.3 mm wide; bases thickened by split, fibrous sheaths. *Leaves* basal, 80–120 cm long, 6–15 mm wide. *Involucral bracts* 4–8, unequal in length, longer than inflorescence, scabrous, septate-nodulose. Proximal bract 19–65 cm long, 3.8–9.8 mm wide. *Inflorescence* decompound, 10–20 cm long, 12–20 cm wide, diffuse. Rays unequal, 9–20. *Spikes* 20–80, globose or ovoid or hemispherical, dense, 10–20 mm long, 15–30 mm wide, with 6–10 spikelets. *Spikelets* 10–20 mm long, 1.8–3.5 mm wide, 10–40 flowered, straight, digitate, erect or spreading, linear. *Glumes* 2–3 (3.3) mm long, apex mucronulate, one half to two thirds imbricate, keeled, with excurved or straight mucro, 0.9–1.1 mm apart, 3–5 nerved; with arcuate keel. Rachilla straight, winged. *Stamens* 3; anthers linear, connective setulose, 1.2–1.7 mm long. *Style* shorter than stigmas, 3-fid, shorter than nut, flat, 0.3–0.6 mm long. *Nut* obovoid, trigonous, faces concave to flat, half to two-thirds as long as glume, 1.1–1.7 mm long, 0.7–1 mm wide, granulose, apex apiculate, brown to golden brown. **Fig. 4 F–K.**

***Additional selected specimens examined*: Queensland.** Cook District: Pajinka, Cape York, Feb 2001, *Cooper 1484 & Jensen** (BRI); Newcastle Bay, 2.5 miles [4.1 km] S of Somerset, May 1948, *Brass 18689* (BRI); 1 km SE of Heathlands, Mar 1993, *Clarkson 9308 & Neldner* (BRI, NSW); Mouth of Pennefather River, Jul 1988, *Dalliston CC306** (BRI); Restoration Beach, *c.* 5 km SW of Cape Weymouth, Feb 1980, *Clarkson 2943** (BRI, NSW); Upper slope of Altanmoui Range, Cape Melville N.P., May 1993, *Neldner 3971** (BRI, NSW); N.P.R. 133, Mt Sorrow ridge walk, Nov 2000, *Ford AF2492** (BRI); Mossman River Gorge, Feb 1932, *Brass 2120* (BRI); Mossman Gorge N.P., Dec 1997, *Forster PIF21950* (BRI); Hills Creek, Murray Prior Range, Mar 2001, *Booth 2538 et al.** (BRI); Near Stoney Creek Falls, near Cairns, May 1962, *Blake 21742** (BRI); Freshwater Creek, Jul 1974, *Byrnes 3069** (BRI); Lake Morris road, Feb 1994, *Jago 3069* (BRI); Hann Tableland, Oct 2005, *Jago 6863** (BRI); Gadgarra via Fuller Road, Mar 2002, *Booth 2975* (BRI); Douglas Track to Glacier Rock, Dec 2001, *Jensen 1154* (BRI).

***Distribution and habitat*:** *Cyperus multispiceus* is endemic to Queensland and has been recorded from Palmerston N.P. northwards to Cape York (**Map 3**). It is found on the margins of rainforest and amongst riparian and semi-deciduous vine forest on coarse sandy loams. *Cyperus multispiceus* is often seen resprouting while evidence of recent fire is still clearly visible.

***Notes*:** *Cyperus multispiceus* is distinctive within this group of species by the tufted habit, triquetrous culms and large number of spikes (20–80) in the compound inflorescence. The bases of the plants are much thickened by the fibrous sheaths.

The Queensland Herbarium has 42 collections of *Cyperus multispiceus*, but only a handful possesses spikelets with fully mature nuts (without * in specimens cited above). The plants seem to reproduce predominately vegetatively. Many specimens have white immature nuts, the sides of the nuts being clearly visible within the spikelets. The mature nuts, when present are golden brown to brown. Often the glumes and nuts fall away, leaving behind the rachis which has the remains of the three stamens still attached to it (**Fig. 4I**). These features also occur in the other three new species that are described in this paper and may reflect a common origin for these species.

The specimen *Jago 4586* from Mt Sorrow W of Cape Tribulation possesses glumes that are mucronate and up to 3.5 mm long, but this is atypical.

***Etymology*:** From the Latin *multi-* (many) and *spiceus* (spiked), so named because of the numerous spikes in the inflorescence.

5. Cyperus sharpei R.Booth, D.J.Moore & Hodgon, **species nova** a *Cypero pedunculosa* rhizomate obesiore et habitatione in clivis aridis saxosis non in silva humidissima differens. **Typus:** Queensland. Cook District: Watsonville, 29 July 1967, *L.J.Brass 33616* (holo: BRI).

Cyperus sp. (Herberton P.R.Sharpe 1449); Booth (2007: 58).

Plants slender, perennial, glabrous, slightly glaucous. *Culms* erect, trigonous, striate, 30–45 cm long, 0.6–2 mm wide, with a bulbous base on a short, stout rhizome. *Leaves* basal, 30–65 cm long, 1–5mm wide. *Involucral bracts* 3–5, unequal in length, longer than inflorescence, scabrous. Proximal bract 10–23 cm long, 1.4–3.8 mm wide. *Inflorescence* once compound, 3–6 cm long, 3–9 cm wide, dense. Rays unequal, 1–6. *Spikes* 2–7, globose or ovoid or hemispherical, dense, 7–25 mm long, 12–30 mm wide, with 6–20 spikelets. *Spikelets* 7–25 mm long, 2.1–3.3 mm wide, 10–34 flowered, digitate, spreading, linear. *Glumes* distichous, 2.5–3.4 mm long, apex mucronate, one half to two thirds imbricate, keeled, with straight mucro, 1.4–1.6 mm apart, 4–6 nerved, with a straight keel. Rachilla straight, winged. *Stamens* 3; anthers linear, connective setulose, 1.2–1.5 mm long. *Style* shorter than stigmas, flat, 0.4–1 mm long. Stigmas 3. *Nut* obovoid to ellipsoid, trigonous, half as long as glume, 1.5–1.9 mm long, 0.7–1 mm wide, granulose, apex apiculate to rounded; brown to light brown. **Fig. 4 A–E.**

***Additional selected specimens examined*: Queensland.** Cook District: On Silver Valley Road, 3.4 km from Mt Misery, Atherton, Apr 1988, *Forster PIF3967* (BRI). North Kennedy District: Herberton Range, Toy Creek, Feb 2001, *Booth 2568* (BRI); Top of ridge behind Caravan Park, Herberton, Jun 1975, *Sharpe s.n.* (BRI [AQ468247]); Herberton, Jan 1918, *Michael s.n.* (BRI [AQ 320372]); Mountain behind Caravan Park, 2 km N of Herberton on road to Atherton, Jun 1975, *Sharpe 1455* (BRI); Junction of Cooloomon and little Cooloomon Creeks, SW of Herberton, May 1962, *Whitehouse s.n.* (BRI [AQ 320373]); 1.5 km W of Herberton on Herberton – Petford road, May 1983, *Conn 1143* (BRI); Hillside behind Caravan Park, Herberton, on Atherton road, June 1975, *Sharpe 1449* (BRI).

***Distribution and habitat*:** *Cyperus sharpei* is endemic to Queensland where it has been recorded predominantly from the Herberton Range and vicinity; there also appears to be a population at Mt Mulligan, an outlying sandstone formation near Dimbulah (**Map 4**). Plants grow in open eucalypt woodland in skeletal soils.

***Notes*:** *Cyperus sharpei* is distinctive within this group of species by the compound inflorescence, the trigonous culms and the stems closely arranged on a stout rhizome.

The Queensland Herbarium holds six collections of *Cyperus* from this group collected in the Mt Mulligan area, two

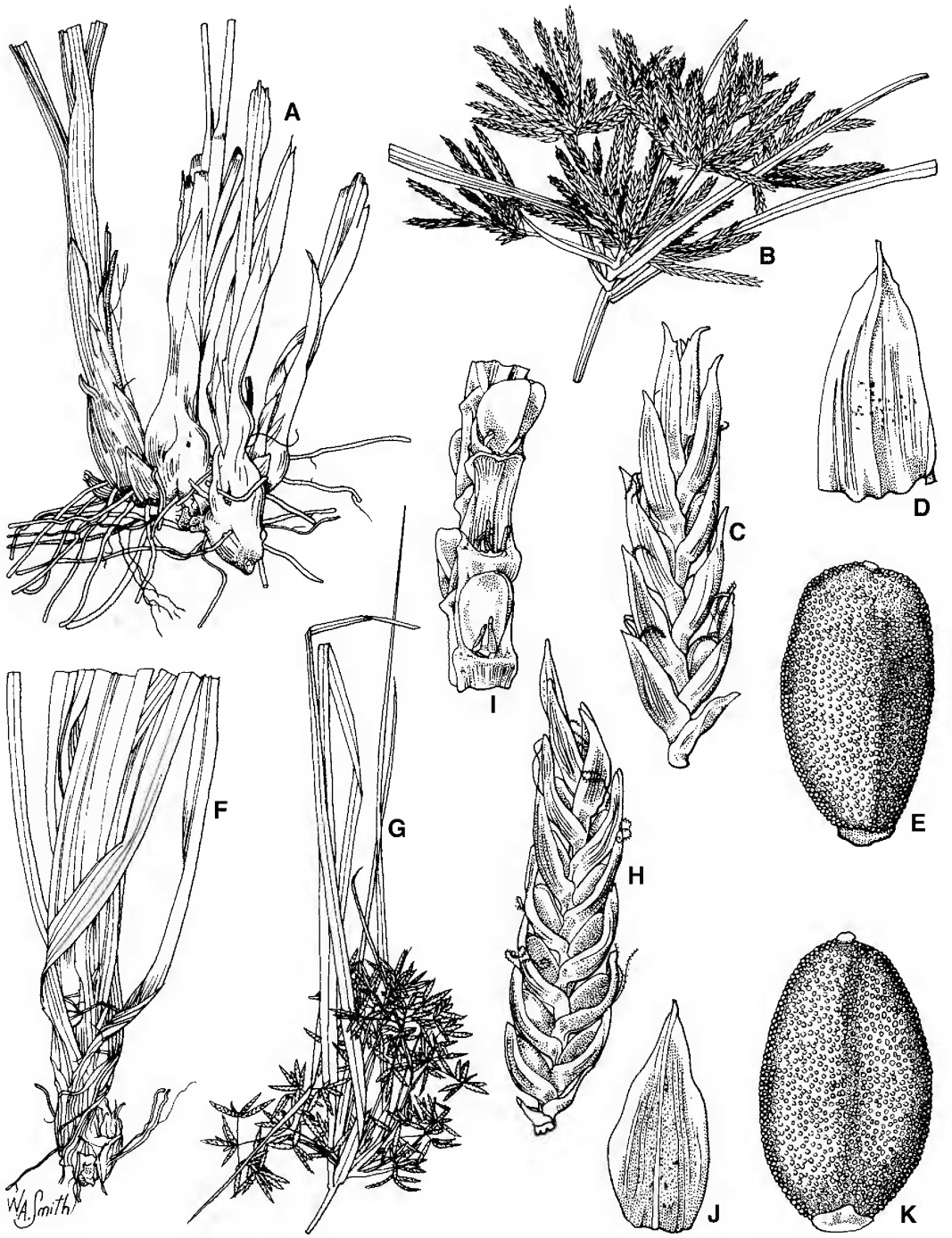

Fig. 4. ***Cyperus sharpei***, A. base of plant showing culms on a short rhizome × 0.8 B. inflorescence × 1. C. spikelet × 6. D. glume × 12. E. nut × 24. ***C. multispiceus***, F. base of plant showing fibrous sheaths × 0.4. G. inflorescence × 0.3. H. spikelet × 6. I. rachilla after glumes and nuts have fallen away showing remains of stamens × 12. J. glume × 12. K. nut × 24. A–E *Sharpe 1449* (BRI); F–K. *Jensen 1154* (BRI).

(*Clarkson 6913b*, *Duretto 378*) have been tentatively identified as *Cyperus multispiceus* and four (*Clarkson 5830a*, *5892*, *Fox* AQ764123, *Jago 3487*) as *C. sharpei*. None of these collections are fully mature and they seem to represent depauperate forms of the respective species. This immaturity makes precise identification of the plants difficult and further collections from this particular area are required for taxonomic clarification.

***Etymology*:** Named in honour of Philip Ridley Sharpe, former curator of Cyperaceae at the Queensland Herbarium and author of a ground breaking synoptic account of the family in Queensland (Sharpe 1986).

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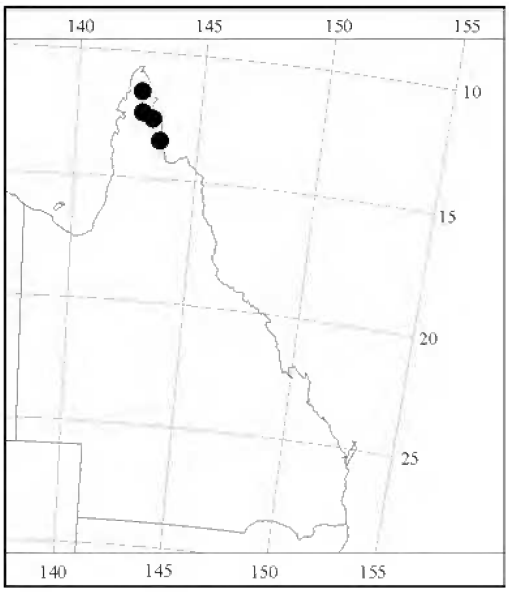
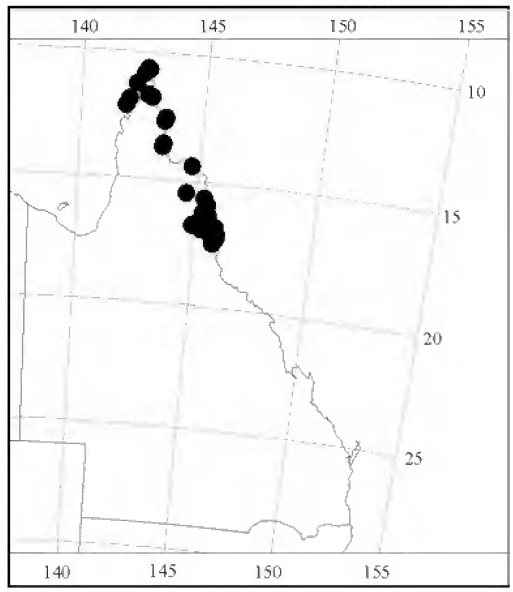
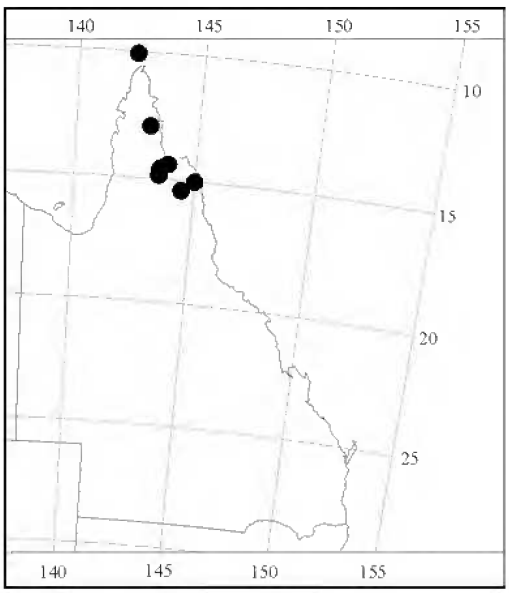


Map 1. Distribution of *Cyperus alaticaulis*



Map 3. Distribution of *Cyperus multispiceus*



Map 2. Distribution of *Cyperus eboracensis*

Map 4. Distribution of *Cyperus sharpei*